

PHYTOTOXICOLOGY INVESTIGATIONS
IN THE VICINITY OF A
TIRE FIRE AT
GORMELY, ONTARIO
AUGUST 31, 1990

FEBRUARY 1993

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IN THE VICINITY OF A TIRE FIRE
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ARB Report 004-91-Phyto

Report prepared by:

W.D. McIlveen
Phytoxicology Section
Air Resources Branch
Ontario Ministry of the Environment

Phytotoxicology Investigations In the Vicinity of a Tire Fire at Gormley, Ontario - August 31, 1990

Introduction

On August 30, 1990, a fire consumed approximately 3000 discarded car tires at the Don Mills Steel and Metal wrecking yard. The wrecking yard is located on Lot 34, Con 4 Woodchurch Twp about 1 km south of the Village of Gormley. The tires were ignited accidentally by equipment operating on the site. Concern was raised that garden and field crops grown in proximity to the fire site might be contaminated by chemicals in the smoke from the burning tires. A request to conduct an appropriate investigation of this possibility was forwarded to the Phytotoxicology Section, Air Resources Branch on August 31, 1990. On that day, W.D. McIveen and T. van der Pol of the Phytotoxicology Section made a site inspection and collected vegetation samples. This report summarizes the information obtained from the investigation.

Site Visit

The area surrounding the fire site is largely agricultural with a few rural residences. The nearest four residential properties to the fire site were inspected (shown in attached figure). None of these properties had a vegetable garden and those persons who were at home during the visit did not express any concern that the properties in question might have been contaminated.

The fire site was located in the north east corner of the wrecking yard. The area to the east of the wrecking yard was a large vacant grassy field. Since the wind during the fire was from the west, any impact from the smoke plume would have presumably occurred in this area.

Small amounts of black soot were visible on the surface of foliage of plants growing in close proximity to the fire site (10 to 25 metres). No such deposits were seen at more distant sites. After initial assessment of residue distribution and vegetation availability, samples of foliage from several plant species were collected at the following locations as shown on the attached figure.

Site No.	Location	Sample No.	Species
1	10 m E	10492	Wild Pear
1	10 m E	10494	Buckthorn
2	200 m E	10493	Wild Pear
2	200 m E	10495	Buckthorn
3	1000 m NNE	10496	Sweet Corn
4	150 m W	10497	Field Corn
5	1.9 km ENE	10498	Sweet Corn
5	1.9 km ENE	10499	Brussels Sprouts

The samples were returned to the Phytotoxicology laboratory for processing. Each sample was split into two sub-samples. One of the sub-samples was placed fresh into amber glass bottles and submitted to the Laboratory Services Branch, Ontario Ministry of the Environment for polycyclic aromatic

hydrocarbon (PAH) analysis. The remaining sub-samples were oven-dried, ground in a Wiley mill and stored in glass bottles. They were then submitted for chemical analysis which included copper, nickel, iron, zinc, lead, cadmium, sodium, cobalt, molybdenum, manganese, chromium, aluminum, strontium and vanadium.

Results

The analytical results for heavy metals are shown in the attached table. Also shown are the Upper Limit of Normal (ULN) values. ULN guidelines were established by the Phytotoxicology Section, Air Resources Branch. The ULN was determined by examining an extensive database for soil and vegetation samples collected at sites removed from any point source of contamination. Statistical tests were applied to the data to calculate the ULN value. This ULN value would not normally be exceeded in 99 samples in 100 for background areas. Values which exceed the ULN are usually considered to have resulted from contamination. Values which exceed the ULN do not necessarily imply that the element is toxic at that level.

In all but three instances, the concentrations of elements measured in the samples were well within the ULN guidelines. The exceptions were molybdenum in corn and sodium in Brussels sprouts. These particular elements are highly unlikely to be associated with emissions from a tire fire. The elevated values are considered to be related to the natural composition of the respective species. Different species may have an inherent tendency to accumulate individual elements and this is not addressed in the ULN guideline.

Samples of pear foliage collected at both locations had very similar analytical profiles. Samples of buckthorn foliage, however, showed that the sample collected nearer to the fire site had higher concentrations of nearly all elements than did the more remote site. For the most part, these differences are not significant and could be attributable to historic contamination through dust dispersal and water movement from the wrecking yard. Based on experience with other tire fires, the pattern of chemical elements in the foliage does not conform to anticipated contaminant accumulation attributable to smoke from the tire fire.

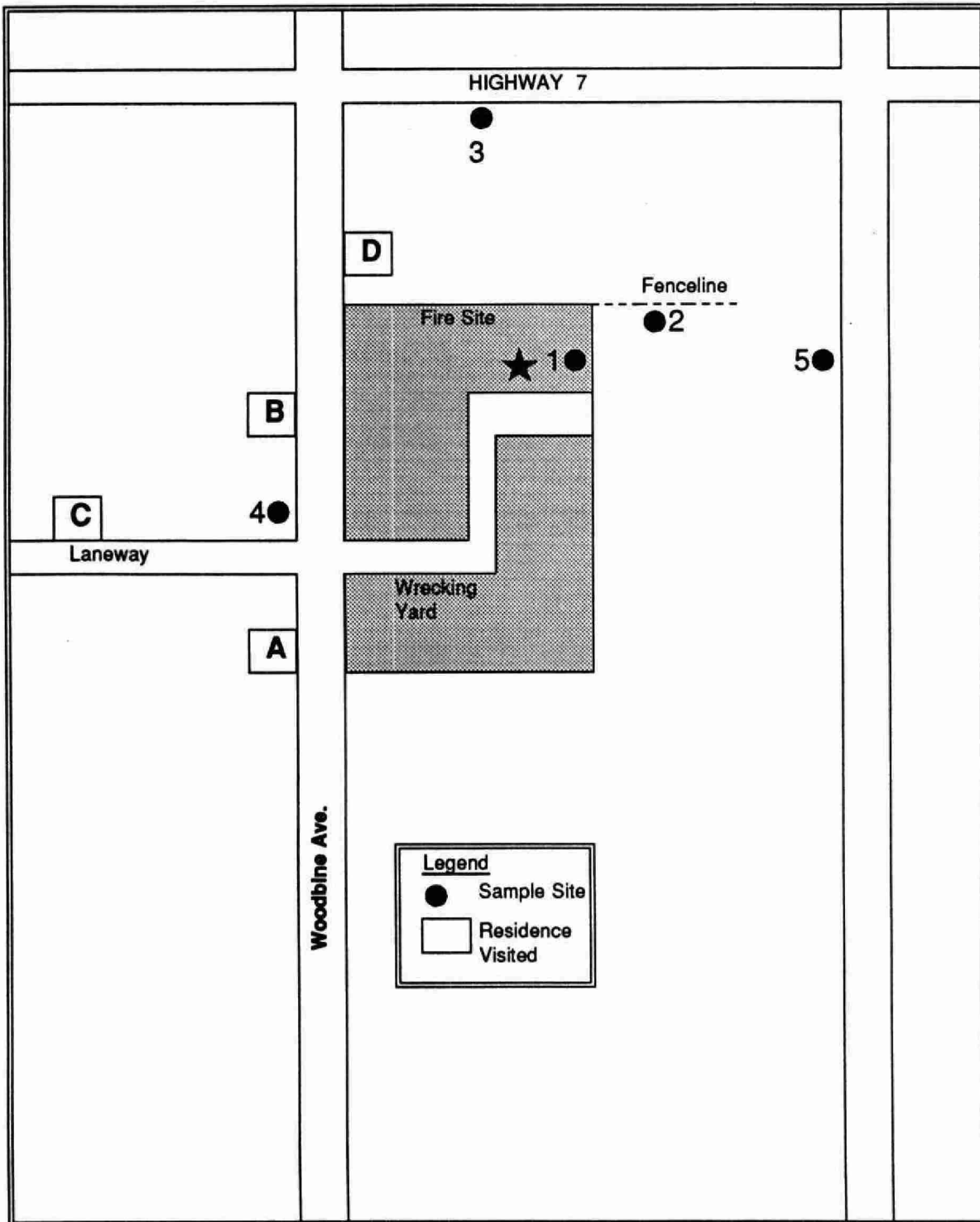
In the case of corn foliage, there was no pattern of elemental composition related to the tire fire. At the site to the west (upwind during the fire), corn foliage had the highest values for most elements in corn. Some of this increase could possibly be related to the proximity of the site to the highway (Woodbine Ave.). This possibility is not supported by sodium values (ie road salt component), but the lead concentration may be related to vehicular emissions. Overall, the chemical composition of the corn appears to be quite normal and there is no reason for concern.

Analytical results for PAH compounds indicated no detectable concentrations in any sample. The PAH compounds included in the testing were Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene, Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(k)fluoranthene, Benzo(b)fluorene, Benzo(a)pyrene, and Ideno(1,2,3-cd)pyrene.

Conclusions

The possibility of contamination of nearby vegetation by emissions from a tire fire near Gormley, Ontario was investigated on August 31, 1990. Upon analysis, samples of several species of vegetation failed to demonstrate elevated concentrations of metallic contaminants or PAH compounds. It was concluded that the magnitude of the fire was either insufficient to cause significant vegetation contamination or that smoke plume rise caused any contaminants to be dispersed to undetectable levels.

Table. Concentrations* of chemical elements in vegetation collected in the vicinity of the Gormley tire fire - August 31, 1990									
Sample No.	10492	10493	10494	10495	10496	10497	10498	10499	
Species	Pear	Pear	Buckthorn	Sweet Corn	Sweet Corn	Corn	Sweet Corn	Brussels Sprouts	ULN
Location**	10 E	200 E	10 E	10 E	1000 E	150 E	1900 E	1900 E	
Element									
Copper	4.2	5.6	7.2	4.7	7.5	12.0	6.8	3.6	20
Nickel	1.3	1.4	1.7	1.3	0.7	0.8	0.6	1.5	5
Lead	1.9	1.4	2.7	<0.5	0.8	2.1	<0.5	<0.5	30
Zinc	25	23	35	9	13	45	27	19	250
Iron	97	92	150	120	93	140	100	68	500
Manganese	20	20	120	20	27	140	50	39	NE
Aluminum	43	53	51	50	29	24	23	11	NE
Cadmium	<.10	<.10	<.10	<.10	<.10	0.18	<.10	0.26	1
Cobalt	1.1	0.9	0.6	0.3	<0.2	0.3	<0.2	<0.2	2
Chromium	<0.5	0.6	0.9	0.6	<0.5	0.9	<0.5	0.7	8
Molybdenum	0.4	<0.2	0.5	0.3	1.6	2.2	1.5	0.8	1.5
Sodium	12	16	18	17	32	20	23	2800	50
Strontium	20	19	37	28	19	12	9.9	45	NE
Vanadium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5
* All values are reported as ug/g dry weight of tissue ** Location is shown a metres and compass bearing from the fire site *** Values which are highlighted exceed the respective ULN's									



Sketch map of vegetation sample sites and residential properties examined in the vicinity of the Gormley tire fire, August 31, 1990



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